

### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—At a convocation on June 18, the honorary degree of D.C.L. was conferred upon Mr. Cornelius N. Dalton, C.B., master of the Drapers' Company.

On the same day, the new Radcliffe Library building, which has been erected by the Drapers' Company at a cost of about 21,000*l.*, was formally handed over to the University in the presence of a large number of members of the Company and of the University.

CAMBRIDGE.—Prof. Newton, F.R.S., has been appointed a manager of the Balfour fund for the ensuing five years.

The Harkness scholarship in geology has been awarded to W. G. Fearnside, Sidney, and the Wiltshire prize in palæontology to E. R. Watson, Jesus.

Thirty-seven names appear in the first class of the natural sciences tripos, part i., and ten in the first class of part ii. Four are the names of Newnham students.

The work of Mr. Hugh Ramage, advanced student of St. John's, on spectrum analysis, has been pronounced "of distinction" as a record of original research and as a qualification for the B.A. degree.

MR. CHAMBERLAIN has addressed a letter to the Lord Mayor of Birmingham, on behalf of the council of the Birmingham University, suggesting that a rate should be made in aid of the University. The amount subscribed for the establishment of the University is 400,000*l.*, but a large proportion of this will be absorbed in the erection and equipment of buildings necessary for instruction and research. The increased cost of maintenance involved in the scheme cannot be wholly provided from the fees of students, and it is on this account that an appeal is made for assistance. In support of the appeal the council refer to the precedents already established in similar cases, notably in connection with University colleges founded in other provincial towns. Thus the corporation of Nottingham contributes 7380*l.* a year to Nottingham College, Sheffield gives nearly 6000*l.* a year to the Firth College, the corporation of Leeds 1500*l.* a year, the corporation of Manchester 1100*l.*, and the corporation of Liverpool, besides a grant of land of the value of 30,000*l.*, an annual contribution of 1800*l.* Other contributions of a substantial character have been made in many cases by the county authorities; and it is hoped that if Birmingham will set the example the counties which will derive benefit from the extension now proposed of University work in the Midlands will not be unwilling to take their share of responsibility. A rate of ½*d.* in the pound would in Birmingham provide an annual contribution of about 5000*l.*, which would justify the council of the University in proceeding immediately with the new departments, the necessity for which, in view of the increasing pressure of foreign competition, is daily becoming more urgent.

At the meeting of the General Medical Council last week a prolonged discussion occurred upon the regulations for the first year of medical study, and the educational institutions which should be accepted as fit and proper places for passing one year of the obligatory five years of professional study. The main question was whether a year at a grammar school, or similar educational establishment where general subjects as well as science is taught, should count as one year of medical training in the five years' curriculum. For one side it was stated that the laboratories at some of the institutions recognised by the Council were as well equipped as those of some medical schools. It was also urged that chemistry, physics and biology might be considered as an extension of the preliminary education required before medical study, properly so called, can be commenced, and that the medical curriculum required should be four years taken subsequently to passing an examination in them. If this view is accepted at the next meeting of the Council, it would seem, says the *British Medical Journal*, that the whole question of the places at which instruction may be obtained may disappear, for it will be argued that, provided the necessary knowledge is obtained and tested by adequate examination, it will no longer be the business of the Council to concern itself how or where it is obtained, any more than in the case of Latin or any other subject of preliminary education. The subject has been referred to the Education Committee of the Council, and judging from the views expressed during the debate it seems that there are

not a few members who think that scientific education is now provided for so well at schools not strictly medical that one year of professional study may properly be carried out in such institutions.

### SCIENTIFIC SERIAL.

*Bulletin of the American Mathematical Society*, May.—The three papers in the present number were all read at the February meeting of the Society. Non-oscillatory linear differential equations of the second order, by Prof. Bôcher, has for its object the deduction of certain conditions that the equation

$$\frac{d^2y}{dx^2} + \frac{pdy}{dx} + qy = 0$$

should be non-oscillatory. This equation is said to be oscillatory or non-oscillatory in the interval  $a \leq x \leq b$ , according as it does or does not have at least one solution (not identically zero) which vanishes more than once in this interval. Conditions have been obtained by Picard, but the method used in the present paper is not only entirely different, but yields, in addition, other results not given by Picard's method. In the author's opinion it is also less artificial.—Concerning real and complex continuous groups, by Prof. L. E. Dickson, is an attempt to illustrate certain differences and analogies between related real and complex continuous groups. Lie's theory has been developed chiefly for the latter groups, the modifications necessary for real groups being treated quite briefly.—On holomorphisms and primitive roots, by Dr. G. A. Miller, is devoted to some additional developments along the earlier line adopted by the author in a previous paper (*Bulletin*, vol. vi. p. 337, 1900).—The following works are reviewed, viz.: "Einleitung in die Theorie der Besselschen Funktionen" (Prof. J. H. Graf and Dr. E. Gubler), by Dr. V. Snyder; and "Leçons sur la théorie des Formes et la Géométrie analytique supérieure" (H. Andoyer), by H. S. White.—The usual points of interest, collegiate and other announcements, and list of recent publications are well to the front.

### SOCIETIES AND ACADEMIES.

#### LONDON.

Royal Society, May 23.—"On the Presence of a Glycolytic Enzyme in Muscle." By Sir Lauder Brunton, F.R.S., and Herbert Rhodes.

For some time physiologists have suspected the presence of some enzyme in muscle which has the power of breaking up the sugar with which the muscle is supplied through the blood, and converting this food into energy with the formation of simpler oxidised bodies. The presence of such an enzyme in fresh muscle juice was apparently proved by Brunton in 1873, but the method of experiment used was open to criticism.

Previous to the present paper the materials used had not been rendered free from possible fermentative organisms, so that it could not be definitely said that the marked glycolytic action exhibited by the juice was not due to some fermenting fungus or bacterial contamination.

The muscle juice was obtained from the yet living flesh of a sheep by comminution with sand and hydraulic expression.

In these later experiments the muscle juice was rendered sterile by filtration through a Pasteur Chamberland candle, the other fluids boiled for considerable periods, and the apparatus disinfected by steam.

Two flasks were prepared, each containing fresh sterile muscle juice and sugar solution; in one the juice was boiled previously to adding the sugar solution.

After incubation at body temperature the sugar in each flask was estimated quantitatively, the result showing a very marked diminution in the percentage of sugar in the flask containing unboiled juice.

Thus it was shown that a substance exists in fresh muscle which has the power of breaking up the sugar molecule, and this substance partakes of the nature of a glycolytic enzyme.

Although an attempt had been made to isolate the enzyme, it is of such a delicate nature that the isolating procedure adopted destroyed its fermenting power.

**Physical Society, June 14.**—Prof. S. P. Thompson, F.R.S., president, in the chair.—A paper on Herr Jahn's measurements of the electromotive force of concentration cells was read by Dr. Lehfeldt. Prof. D. Jahn has recently published measurements of E.M.F.'s of concentration cells, from which he has endeavoured to show that the law of dilution is applicable to strong solutions. The author points out that his conclusions are based on argument in a circle because Ostwald's law is assumed in the formula used by Jahn for calculating degrees of concentration. The formulæ of Nernst and Arrhenius do not yield consistent results, and it is suggested that the former is suitable for calculating concentrations and the latter for calculating osmotic pressures.—A paper on the mechanism of radiation was read by Mr. J. H. Jeans. This paper contains an attempt to obtain answers to two questions:—(1) What inferences can be drawn as to the mechanism by which radiation is emitted from an examination of the formula of physical optics? and (2) Is it possible, with the help of these inferences, to frame any conception of matter which will give a consistent account of the various optical phenomena? Starting with general spectroscopy, the author has written down the radiation due to a single rotating molecule vibrating harmonically. The effect of a number of molecules is deduced, and it is shown that the condition that the continuous banded spectrum shall be absent is that either the period of rotation must be large compared with the period of vibration or the radiation from a molecule must be spherically symmetrical. Passing on to dispersion, even if the radiation is continuous between collisions, there will be a discontinuity at every collision and the train of waves will be no longer regular. It is customary to assume that the vibrations of a dispersing medium are sympathetic with the irregular incident light. The author has calculated the ratio between forced and free vibrations in a prism or grating, and finds that if the dispersion is to be regular the vibrations must be only slightly influenced by collisions, and this requires, as in the former case, that either the period of rotation is large compared with the period of vibration, or the radiation is spherically symmetrical. As this is not the case with molecules the author thinks that the line spectrum is emitted by atoms, that these atoms must be dissociated and that the shape of these atoms is one of spherical symmetry. It is shown that if an atom is an electromagnetic system, similar to a planetary system, then the periods of such an atom would not be fixed and there would be no reason for a line spectrum. The normal atom is therefore regarded as an electrostatic system, with some law of force, other than the inverse square law, holding at interionic distances. Such an atom when at rest would give a pure line spectrum. Rotation of such an atom causes the lines of the spectrum to shift towards the red, and as the rotation is different for different atoms the lines will not only be shifted, but broadened. To calculate the periods of vibration of an atom the author has assumed it to consist of an infinitely great number of infinitely small ions. The spectrum of this consists of a collection of spectrum series each possessing a definite head and capable of explaining doublets, triplets, &c. It is shown that under the action of a magnetic field a line may separate out into approximately equidistant lines, the central lines maintaining its position. In conclusion, the author points to many other physical phenomena which can be explained by the theory described.—The chairman then exhibited some specimens of Jena glass. In describing these, reference was made to a diagram showing the refractive index, dispersion between the C and F lines, and the reciprocal of the dispersive power of any piece of glass. For this latter quantity the symbol " $\nu$ " is used, and it was suggested to call it the achromatic refractivity of the glass. The introduction of barium increases the deviation, but leaves the dispersion unaltered. It is possible now to get crown glass with a higher refractive index than flint glass, and this makes it possible to construct an achromatic lens which will also give a flat field. It is usual in making achromatic objectives to make them accurately achromatic for the red and violet rays. A better effect can be obtained by having approximate achromatism throughout the length of the spectrum. This is achieved by matching the irrationality of one glass by means of another and then constructing an achromatic pair with these two glasses. "Telescope crown" and "telescope flint" are two glasses which give similar spectra and approximate achromatism from the red to the violet.—The Society then adjourned until June 28, when the meeting will be held, by the invitation of Prof. W. G. Adams, in the laboratory of King's College.

**Geological Society, June 5.**—Mr. J. J. H. Teall, V.P.R.S., president, in the chair.—On the passage of a seam of coal into a seam of dolomite, by Aubrey Strahan. The author was informed by Mr. N. R. Griffith in 1900 that the seven-feet seam of the Wirral Colliery had been found to pass into stone of an unusual character. For a distance of 1600 yards from the shaft this seam was good, and about 4 feet thick. A little farther in bands of stone from 1 to 10 inches thick made their appearance in it, and, gradually increasing in thickness, these bands eventually constituted the whole seam, the last traces of workable coal disappearing at 250 yards from the point where the change first began. The boundary of the barren area has been found for a distance of 1480 yards, and it runs north and south. The stone is at first black, but after weathering it becomes grey, and displays curious structures, among which are pisolitic, or mammillated structures, the intervening spaces being filled with coaly matter. One specimen displays woody tissue filled with dolomite. Analyses by Dr. W. Pollard yield from 18.5 to 13 per cent. of magnesia. The phenomena are not those of a "wash-out," as there is no sign of erosion, but there is proof that the dolomite was formed in almost motionless water, and the conditions appear to have been those under which a tufa would form. It appears to have been formed on a spot to which clastic material scarcely gained access, and which was reached even by vegetable matter in scant quantity and in a finely divided condition.—On some landslips in boulder-clay near Scarborough, by Horace W. Monckton.

## EDINBURGH.

**Royal Society, June 3.**—Dr. Hepburn in the chair.—In a paper on binary fission in the life-history of Ciliata, Dr. J. Y. Simpson gave excerpts from statistics of two months' cultures of *Paramoecium caudatum* showing that under the most natural circumstances attainable binary fission does not proceed with that mechanical regularity that Maupas asserted. Further, experimenting with cultures of *Stylosicchia pustulata*, he found with Joukowsky as against Maupas that degeneration after continued division shows itself in a general listlessness, in ebbing of vital energy and decrease of size, rather than in definite nuclear disorganisation, but on the other hand, with Maupas as against Joukowsky, that it is not possible to induce conjugation before puberty. Some *Paramoecium* monstrosities were described, and microphotographs of living *P. aurelia* and *P. caudatum* were shown, establishing the existence of the two species which had recently been called in question.—Dr. E. G. Coker communicated a paper in which were described his various forms of apparatus for measuring strain and applying stress, together with a great many measurements made by means of them. The aim in all was to have the different parts of the measuring apparatus attached to the specimen itself; and probably the most ingenious arrangement was the device for applying and measuring the effects of combined bending and twisting. Another combination was longitudinal stretch and twist. The influence of the one kind of strain upon the elastic relations of the other kind were carefully investigated, especially in the neighbourhood of the yield-point. The behaviour of iron and steel bars when subjected to strain cycles was also studied, and other important questions connected with hysteresis, fatigue and recovery in time.—Mr. W. E. Collinge communicated a paper on the anatomy of a collection of slugs from North-west Borneo, the general results being as follows. The *Damayantia plecta* of Issel was re-described and some notes given on the anatomy of the new species, *D. carinata*. Two new genera were established, viz., *Wiegmannia* and *Isselentia*, with five new species. The *Damayantia smithi* (Cllge. and Godw., Auct.) was shown on anatomical grounds to belong to the genus *Collingia*. Finally two new species of *Veronicella* and one of *Onchidium* were described, and a check list of the known species from Borneo was given.

## PARIS.

**Academy of Sciences, June 10.**—M. Fouqué in the chair.—Studies in neutralisation. On the titration of acids and alkalis of complex function with the aid of colouring matters, by M. Berthelot. A study of the behaviour of some amino-acids towards indicators. Of these glycocoll and leucine are acid to phenolphthalein, alkaline to methyl-orange, and neutral to litmus. The three aminobenzoic acids have a clearly acid function except towards methyl-orange.—The phenomena of



calorific convection and the boiling power of liquids, by M. J. Boussinesq.—On the series of Bernoulli, by M. G. Mittag-Leffler.—On the Eulerian incomplete integrals of the second species and the indefinite integrals of the preceding functions, by M. E. Vallier.—On the region of convergence of an infinite integral, by M. E. Phragmén.—On a remarkable invariant of certain transformations realised by self-recording apparatus, by M. Rabut.—The laws of Gay-Lussac and the dissociation of gaseous compounds, by M. A. Ponsot. It is usually held that the law of Avogadro is an approximate law which tends to become more exact as the volume increases. According to the investigation in the present paper this is not the case.—The vibrations produced in a wire with an influence machine, by M. D. Negreano. If an insulated stretched wire contained in a tube is connected with one of the poles of a Wimshurst influence machine, transverse vibrations are set up in the wire, and if viewed in the dark, portions of the wire become visible.—On an electrolytic rectifier, by M. Ch. Pollak. A description of the conditions under which it is possible to use aluminium electrodes in an electrolytic apparatus for rectifying alternating currents, together with the precautions necessary in forming the plates.—On an electrical grismometer, by M. G. Léon. Two small platinum wires forming two of the arms of a Wheatstone's bridge are kept at a red heat by a small battery of accumulators, one of the wires being placed in pure air and the other in the atmosphere containing methane. The presence of the methane causes a rise in the temperature of the latter wire which results in a deflection of the galvanometer, this deflection being proportional to the amount of marsh gas present.—On the experimental verification of a law of chemical mechanics, by M. H. Pélabon. The reaction between hydrogen and mercuric sulphide has been experimentally studied and the results applied to the verification of the formula  $p_1 p_2 / p_3 p_4 = f(T)$ .—The action of a metallic hydrate upon a salt of another metal. Basic salts with two metals, by M. A. Recoura. Results of experiments upon the reactions between copper hydrate upon solutions of zinc sulphate, and of the sulphates of cadmium, manganese, cobalt, nickel and copper.—On the imidodithiocarbonic esters,  $RN : C(SR')$ , by M. Marcel Delépine.—On the active erythritols, by MM. L. Maquenne and G. Bertrand. Measurements of the rotatory power of the two erythritols in water and in alcohol, and description of the preparation of the tetra-acetyl, benzoyl and valeryl derivatives, and also of the oxidation products.—Study of a densimeter for the determination of the baking value of wheaten flour, by M. E. Fleurent.—Analysis of some travertines from the Vichy basin, by MM. C. Girard and F. Bordes.—On the olive gabbro from Koswinsky-Kamen (Ural), by MM. L. Duparc and F. Pearce.—On the function of the eustatic oscillations of the level of the base in the formation of systems of terraces in some valleys, by M. D. Lamothe.—On the morphology of the sexual elements in some species of Stylorhynchus by M. Louis Léger.—On the constant presence of a gregariniform stage in the cycle of evolution of hematozoa of malaria, by M. A. Billel.—New observations on the parthenogenesis of the sea urchin, by M. G. Viguier.—On the use of silicotungstic acid as a reagent for the alkaloids of urine. The variations of alkaloidal nitrogen, by M. H. Guillemard. The ratio of the alkaloidal nitrogen to the total nitrogen existing in urine varies to some extent with the food, but in certain febrile diseases this ratio undergoes enormous variations, there being in the latter case a considerable increase in both the absolute and relative quantities of the alkaloids eliminated.—On the otoliths of the frog, by M. Marage.—On a new method of examination for the typhoid bacillus, by M. R. Cambier. It is found that if a sterile broth contained in a tube of biscuit porcelain, which latter dips also into sterile broth, is inoculated with the typhoid bacillus, in the course of its growth the bacillus is able to make its way through the porcelain, even although this same porcelain is quite capable of filtering off the bacillus in the ordinary way. It was found that the more actively motile the bacillus the more easily was the filter penetrated in this way. Several other species of bacilli were found to be capable of traversing the walls of the filter in a similar way, but none of the species examined up to the present pass through so rapidly as the typhoid bacillus. On the basis of these observations the author founds a method of determining the presence of this bacillus in potable water, and he has been able to recognise the Eberth bacillus in water from the Seine and the Marne and also in the waters from certain springs.—Six months' meteorological observations at Quito, by M. F. Gonnessiat.

## DIARY OF SOCIETIES.

THURSDAY, JUNE 20.

ROYAL SOCIETY, at 4.30.—The Nature and Origin of the Poison of *Lotus arabicus*: W. R. Dunstan, F.R.S., and T. A. Henry.—(1) On the Mathematical Theory of Errors of Judgment, with Special Reference to the Personal Equation; (2) Mathematical Contributions to the Theory of Evolution. X. Supplement to a Memoir on Skew Variation: Prof. K. Pearson, F.R.S.—On the Application of Maxwell's Curves to Three-Colour Work, with Especial Reference to the Nature of the Inks to be employed, and to the Determination of the Suitable Light-filters: Dr. R. S. Clay.—On the Structure and Affinities of *Dipteris*, with Notes on the Geological History of the Dipteridinae: A. C. Seward, F.R.S., and Miss E. Dale.—(1) Further Observations on Nova Persei, No. 3; (2) Total Eclipse of the Sun, May 28, 1900: Account of the Observations made by the Solar Physics Observatory Eclipse Expedition and the Officers and Men of H.M.S. *Thesus*, at Santa Pola, Spain: Sir Norman Lockyer, K.C.B., F.R.S.—The Mechanism of the Electric Arc: Mrs. H. Ayrton.—And other Papers.

LINNEAN SOCIETY, at 8.—On the Freshwater Algae of Ceylon: W. West and G. S. West.—On Coprophilous Fungi: George Massee and E. Salmon.—Revision of the Genus *Hypericophyllum*, Steetz, with Notes on certain Genera with which it has been confused: N. E. Brown.

CHEMICAL SOCIETY, at 8.—Ballot for the Election of Fellows.—The Direct Union of Carbon and Hydrogen, Part II.: W. A. Bone and D. S. Jerdan.—Ammonium and other Imidosulphites: E. Divers and M. Ogawa.—Nitrilosulphates: E. Divers and T. Haga.—The Decomposition of Hydrocarbons at High Temperatures: W. A. Bone and D. S. Jerdan.—The Sugars from Cellulose: H. J. H. Fenton.—On a Theory of Chemical Combination: G. Martin.—On the Occurrence of Paraffins in the Leaf of Tobacco: Dr. T. E. Thorpe, C.B., F.R.S., and John Holmes.—Studies in the Camphane Series, Part IV.: M. O. Forster.—On the Decomposition of Carbon Dioxide, when submitted to Electric Discharge at Low Pressures: Dr. J. N. Collie, F.R.S.—Two New Substances in Lemon Oil: H. E. Burgess.

MONDAY, JUNE 24.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—The Belgian Antarctic Expedition: Henryk Arctowski.

## CONTENTS.

PAGE

Charles St. John. By T. Digby Pigott, C.B. . . .	177
Exercises in Hygiene . . . . .	178
Public Water Supplies . . . . .	179
Our Book Shelf:—	
Börnstein: "Leitfaden der Wetterkunde. Gemeinver-	
ständlich bearbeitet" . . . . .	180
St. Clair: "Myths of Greece explained and dated.	
An Embalmed History from Uranus to Perseus,	
including the Eleusinian Mysteries and the	
Olympic Games" . . . . .	180
Letters to the Editor:—	
Does Chemical Transformation Influence Weight?—	
Lord Rayleigh, F.R.S. . . . .	181
The National Antarctic Expedition.—Prof. J. W.	
Gregory, F.R.S. . . . .	181
The Settlement of Solid Matter in Fresh and Salt	
Water.—W. H. Wheeler . . . . .	181
The Subjective Lowering of Pitch.—Prof. F. J.	
Allen; G. W. Hemming; E. Hurren Harding . . . . .	182
The National Antarctic Expedition . . . . .	182
The Telephone. ( <i>Illustrated.</i> ) . . . . .	183
The Ninth Jubilee of Glasgow University . . . . .	186
Notes. ( <i>Illustrated.</i> ) . . . . .	187
Our Astronomical Column:—	
Observations of Nova Persei . . . . .	191
Comet 1901 a . . . . .	191
New Variable Stars . . . . .	191
Forms of Images in Stellar Photography . . . . .	191
The Sixth Annual Congress of the South-eastern	
Union of Scientific Societies . . . . .	192
Some Recent Work on Diffusion. II. ( <i>Illustrated.</i> )	
By Dr. Horace T. Brown, F.R.S. . . . .	193
A Long Period Sunspot Variation. ( <i>With Diagrams.</i> )	
By Dr. William J. S. Lockyer . . . . .	196
University and Educational Intelligence . . . . .	198
Scientific Serial . . . . .	198
Societies and Academies . . . . .	198
Diary of Societies . . . . .	200